MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

PMT0204 – FUNDAMENTAL MATHEMATICS II
(All sections / Groups)

30 May 2019
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of THREE (3) printed pages with 4 questions only.
2. Answer all FOUR (4) questions.
3. Write all your answers in the answer booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.

Question 1 (25 Marks)

a) If $A = \begin{bmatrix} 1 & -2 \\ 4 & 1 \end{bmatrix}$ $B = \begin{bmatrix} a & 2 \\ b & 1 \end{bmatrix}$ find the values of a and b such that **AB** = **BA**.

(6 marks)

b) Find $\begin{pmatrix} 1 & 0 & 2 \\ -3 & 2 & 0 \end{pmatrix}\begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 5 & 5 \end{pmatrix}$ **(3 marks)**

c) Given the determinant $\begin{vmatrix} -3 & 1 & 2 \\ 2 & x+1 & 2 \\ 2 & 1 & x+2 \end{vmatrix} = 0$, find the value(s) of x.

(6 marks)

d) Solve the following system of equation using the Cramer's rule.

$$\begin{aligned} 2x + y + z &= 1 \\ x - 2y - 3z &= 1 \\ 3x + 2y + 4z &= 5 \end{aligned}$$

(10 marks)

Question 2 (25 Marks)

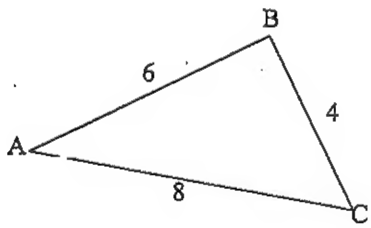
a) If $\cos\theta = \frac{2}{3}$ find $\cot\theta$. **(4 marks)**

b) Graph the sinusoidal function $y = 2cos\left(\frac{\pi}{2}x + \pi\right) + 1$. State the amplitude, period and phase shift.

(7 marks)

c) Solve the equation $2sin^2\theta + 7cos\theta - 5 = 0$ for $0 \le \theta \le 2\pi$. **(9 marks)**

d) In the triangle shown below, find the measure of angle A. **(5 marks)**



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Question 3 (25 Marks)

a) Evaluate

i. $\lim_{x\to 0}\left(\frac{3x^2+x-2}{2x^3+5x+3}\right)$ **(2 marks)**

ii. $\lim_{x\to\infty}\left(\frac{2x^2+1}{5x+2x^2}\right)$ **(3 marks)**

b) Find the derivative of the following functions:

i. $y = x^3e^{2x}$ **(5 marks)**

ii. $y = \ln(x - x^5)$ **(6 marks)**

c) Given $f(x) = x^4 - 4x^3 + 10$, find where the graph of f is increasing, decreasing, concave up and concave down.

(9 marks)

Question 4 (25 Marks)

a) Integrate $\int\left(2e^{2x} + \frac{1}{x+5} - 4x\right)dx.$ **(5 marks)**

b) Evaluate $\int_0^1\left(\frac{x+2}{x^2-1}\right)dx$ by using partial derivative technique.

(10 marks)

c) Calculate the area of the region enclosed by the line $y = x + 1$ and the curve $y = x^2 - 2x + 1$. Sketch the area of the graph and show the intersection points.

(10 marks)

End of Page

FORMULA

A. Trigonometric Identities

Pythagorean Identities

$\cos^2 A+\sin^2 A=1 \qquad \sec^2 A=1+\tan^2 A \qquad \csc^2 A=1+\cot^2 A$

Law of sines $\dfrac{\sin A}{a}=\dfrac{\sin B}{b}=\dfrac{\sin C}{c}$

Law of cosines

$$a^2=b^2+c^2-2bc\cos A$$
$$b^2=a^2+c^2-2ac\cos B$$
$$c^2=a^2+b^2-2ab\cos C$$

B. Differentiation Rules

Product-to-Sum Formulas

$\dfrac{d}{dx}[x^n]=nx^{n-1}$; n is any real number

$\dfrac{d}{dx}[f(x).g(x)]=f(x)g'(x)+f'(x)g(x)$; The Product Rule

$\dfrac{d}{dx}\left[\dfrac{f(x)}{g(x)}\right]=\dfrac{g(x)f'(x)-f(x)g'(x)}{[g(x)]^2}$; The Quotient Rule

$\dfrac{d}{dx}f(g(x)=f'(g(x)).g'(x)$; The Chain Rule

$\dfrac{d}{dx}[g(x)]^n=n[g(x)]^{n-1}.g'(x)$; The power rule combined with the chain rule

$\dfrac{d}{dx}[\sin x]=\cos x \qquad \dfrac{d}{dx}[\cos x]=-\sin x \qquad \dfrac{d}{dx}[\tan x]=\sec^2 x$

$\dfrac{d}{dx}[\sec x]=\sec x\tan x \qquad \dfrac{d}{dx}[\cot x]=-\csc^2 x \qquad \dfrac{d}{dx}[\csc x]=-\csc x\cot x$

$\dfrac{d}{dx}[e^x]=e^x \qquad \dfrac{d}{dx}[\ln x]=\dfrac{1}{x};\quad x>0$

C. Basic Integration Formulas

$\int cf(x)\,dx=c\int f(x)\,dx \qquad \int k.dx=kx+C$

$\int[f(x)\pm g(x)]dx=\int f(x)dx\pm\int g(x)dx \qquad \int x^n dx=\dfrac{x^{n+1}}{n+1}+C,\quad n\neq -1$

$\int e^x\,dx=e^x+C \qquad \int\dfrac{1}{x}dx=\ln|x|+C$

Integration by-parts: $\int u\,dv=uv-\int v\,du$

Volume (disk) $=\pi\int_a^b (f(x))^2\,dx$

Area $=\int_a^b (f(x)-g(x))dx$

Volume (washer) $=\pi\int_a^b\left[(f(x))^2-(g(x))^2\right]dx$